In the measurements we employ the same magnifier A, and in the same relative position which it had in respect to the plate P on the occasion of the impression.

Making the luminous rays describe a path exactly opposite to that which they had in producing the picture, it is evident that the rays which have traversed the plate, proceed within the cone $O N N'$ (the others are cut off by the diaphragm G at the optical point o), and traverse the lenses of the magnifier through the same points of the lenses which they had traversed in their path through the plate; and, consequently, in this second passage are modified equally, but in the contrary sense, so that the new image at F is exactly equal to the focal image of the object-glass, the effects of distortion thus disappearing. Placing a micrometer at C, we can make the measures as in the direct observation of the Sun.

It is obvious that it is quite a different thing to measure the image of the Sun thus diminished by the magnifier, or to measure a photographic image produced by the object-glass; in this second case all the imperfections are augmented; one magnifies the granulation of the collodion, or of the silver, &c.; which does not happen in the first case.

These are the principal points of the method we had decided upon, and which unfortunately, will not be realised; it is just this which I regret, not to be able to realise a plan which in all probability would have succeeded.

If you approve of any of these points, for instance the method of measuring the photograms, it might be possible to employ them at some of the English stations.

Lisbon,
  1874, *April* 26.

Signor Capello, in a subsequent letter, enquires whether the *personnel* of the different English expeditions is quite filled up; and, in the contrary case, whether it would be possible for him to join in any one of them; by preference in the Northern hemisphere, so as not to take him too long a time from the Observatory. He has practised magnetic observations for sixteen years.

On the Lunar Semi-diameter derived from Occultations of Stars.
By E. Neison, Esq.

It has been shown from a reduction of the Greenwich observation for the years 1861–1870 that the semi-diameter given by occultations of stars at the dark limb was considerably less than Hansen's value. As a variation in the apparent semi-diameter arising from irradiation was found with instruments of different aperture, it became necessary to determine if a similar variation existed in

the correction from occultations.   For this purpose the observations made at the Radcliffe Observatory with an aperture of $7\frac{1}{2}$ inches during the period 1862–1872, and those made at Cambridge with a mean aperture of 11 inches during the period 1861–1869, were compared with the Greenwich observations for 1861–1871, made with an average aperture of about 6 inches.

Seeing the great difficulty in making the observations, the small number made, and the one-sided nature of the errors, the determinations from the re-appearances are omitted.

	Disappearances at Dark Limb.	No. of Obs.	Disappearances at Bright Limb.	No. of Obs.
Greenwich	$-1\overset{''}{\cdot}73$	42	$+1\overset{''}{\cdot}06$	12
Radcliffe	$-1\cdot81$	30	$+0\cdot52$	13
Cambridge	$-1\cdot95$	14	$+0\cdot01$	3

The correction for the first class is nearly constant; while the gradually decreasing correction with increase of aperture in the second class, is exactly what is to be anticipated.   It is evident that only in the disappearances at the dark limb is the full effect of the correction apparent; for at the disappearances at the bright limb, owing to the great comparative faintness of the star, there is a considerable tendency to lose sight of it before actual occultation. The very great difficulty in observing the reappearances at the exact instant of becoming visible, and not a few seconds later, tends, like the one-sided nature of the resulting error, to increase the real occultation semi-diameter, and so lessen very much their value.

Combining now the whole series of 176 observations, we have, as the correction to Hansen's semi-diameter :

	Correction.	No. of Obs.
Disappearances at the Dark Limb	$-1\overset{''}{\cdot}80$	86
„ „ Bright Limb	$+0\cdot70$	28
Reappearances at the Dark Limb	$+0\cdot13$	29
„ „ Bright Limb	$+1\cdot84$	33

Owing to the irradiation at the lunar limb, the actual mean diameter is not known; but the minimum value it can have, is found from observations of Solar eclipses where the effects of irradiation are reversed.

As the effect of irradiation appears to vary directly as the difference in brilliancy of the two objects, it is to be expected that its effects would be greater in the case of the dark Moon on the Sun's disk than in that of the bright Moon against the sky.   Assuming that of the difference observed between the diameters of the bright and of the dark eclipsed Moon a little over one-half is due to solar irradiation, as the contact is then greatest, the minimum

lunar semi-diameter can be found. For the observations of the Eclipses of July 18, 1860, and December 21, 1870, at Greenwich with the great Equatoreal, give as the minimum value for the mean lunar semi-diameter, Hansen's value less $0''\cdot13$ and less $0''\cdot20$ respectively. This value being still over $1\cdot''60$ greater than the occultation semi-diameter, it would appear that irradiation fails to account for the difference found to exist.

To compare these results with those obtained by the Astronomer Royal (*Greenwich Observations*, 1864), they were reduced to the same parallax and semi-diameter there used. As the earlier observations of the series employed by the Astronomer Royal are by no means so good as those made at later periods, when the Altazimuth has been in use, they are omitted. Employing then those made during the period 1850–1860, with an average aperture of a little over four inches, and comparing with the results of the later Greenwich, and the Radcliffe and Cambridge observations, we have, for the disappearances at the dark limb:

$$
\begin{array}{ll}
\text{Greenwich, 1850–1860} = -2\overset{''}{\cdot}45 & \text{Greenwich, 1861–1871} = -2\overset{''}{\cdot}87 \\
\text{Radcliffe,} \quad \text{1862–1872} = -2\cdot81 & \text{Cambridge, 1861–1869} = -2\cdot87
\end{array}
$$

Finally combining the whole four series, we have, as reliable values, from 303 observations, reduced from good lunar places, and with fine instruments, for the correction to the telescopic semi-diameter employed by the Astronomer Royal:

$$
\begin{array}{lll}
\text{Disappearances at the Dark Limb} & = -2\overset{''}{\cdot}74 \text{ from } & 143 \text{ obs.} \\
\text{}\quad,, \quad\quad,, \quad \text{Bright Limb} & = -1\cdot29 \quad,, & 46 \text{ obs.} \\
\text{Reappearances at the Dark Limb} & = -1\cdot08 \quad,, & 58 \text{ obs.} \\
\text{}\quad,, \quad\quad,, \quad \text{Bright Limb} & = +0\cdot46 \quad,, & 56 \text{ obs.}
\end{array}
$$

London,
1874, 30*th March.*

The Solar and Planetary Systems.   **By Maxwell Hall, Esq.**

The author states Bode's law as follows :—" In the solar and planetary systems the mean distances of the planets and satellites do not greatly differ in value from the terms of the series :

$$4\lambda, \ 7\lambda, \ 10\lambda, \ 16\lambda, \ 28\lambda, \ 52\lambda, \ 100\lambda, \ 196\lambda, \ 388\lambda, \ \&c.,$$

where λ has different values in different systems. But there may be more than one, or there may be no planet or satellite near any of the above theoretical distances." And he then proceeds to determine λ in miles for the planetary system, and for the Jovian, Saturnian, and Uranian satellite systems respectively.